

### Remarks

Claims 1-38 and 71-85 were pending. Claims 1-38 were examined in the Office Action that was mailed April 22, 2003; claims 71-85 were withdrawn from consideration as being drawn to a non-elected invention. Claims 1-38 were rejected. The present Response amends claim 1, cancels claims 71-85 and adds new claims 116-125. Each of the objections and rejections raised in the Office Action is addressed individually below.

### Specification

The Examiner objected to the disclosure because of certain informalities, which required appropriate correction. Appropriate correction has been made as follows. At page 9, line 28, "Figure 1 depicts" was replaced with --Figures 1A-1F depict--. At page 10, line 6, "Figure 5 depicts" was replaced with --Figures 5A-5D depict--. At page 10, line 9, "Figure 8 depict" was replaced with --Figure 8A-8D--. At page 4, line 4, the second appearance of "of" has been replaced with --from--. At page 28, line 6, the U.S. Patent No. has been corrected to read 6,004,444 instead of 6,044,444 (see Information Disclosure Statement filed June 3, 2002). In light of these amendments, withdrawal of this aspect of the rejection is requested.

### Amendment

Claims 71-85 have been canceled. Cancellation of claims 71-85 is made without prejudice, without intent to abandon any original claimed subject matter, and without intent to acquiesce in any rejection of record. Applicant reserves the right to file one or more continuing applications containing these canceled claims.

Claim 1 has been amended to specify that the stamp is a *non-planar* stamp. This amendment is supported by the specification as filed, e.g., see the Figures and page 12, line 12 to page 13, line 9. Applicant respectfully submits that no new matter is added by way of this amendment.

New claims 116-125 have also been added. Claim 116 is an independent claim that parallels original claim 1 and further specifies that the stamp comprises a lumen having a portal providing communication between the lumen and an exterior of the stamp. This new claim corresponds to original dependent claim 33 (see also, e.g., page 12, lines 12-14 for support). New independent claim 116 and claims 117-125 that depend therefrom are therefore drawn to the elected invention of claims 1-38. Dependent claim 117 specifies that the lumen includes two

portals (e.g., see page 12, lines 14-15); claim 118 specifies that the walls defining the lumen are characterized by flat, curved, or a combination of both (see original claim 34; page 12, line 15 to page 13, line 2; and the Figures); claim 119 specifies that the stamp comprises a tube or balloon (see original claim 35; page 12, lines 14-15; and the Figures); claims 120-122 relate to methods for stamping the outer surface of a substrate (e.g., see Figure 1 and page 11, lines 5-20); and claims 123-125 relate to methods for stamping the inner surface of a hollow substrate (e.g., see Figures 5A-D and page 17, line 23 to page 18, line 2).

#### Rejections Under 35 U.S.C. § 102

Claims 1-4, 6, 7, 9, 10, 30, 31, and 37 were rejected under 35 U.S.C. § 102(b) as being anticipated by Maracas et al. (U.S. Patent No. 5,669,303). The Examiner states that the claims are drawn to a method of patterning a surface by providing a stamp having a stamping surface disposing a substrate proximate to the stamping surface and modulating the dimensions of the stamp to place the stamping surface in contact with the substrate. The Examiner further states that Maracas et al. disclose stamping a surface with a flexible stamp by using pressure to cause the flexible stamp to change shape and contact a surface to be stamped. The Examiner concludes that changing the shape of the flexible stamp of Maracas et al. modulates dimensions of the stamp, and the method of Maracas et al. is the same as presently claimed. Applicant disagrees.

As amended, independent claim 1 now recites a method of patterning a surface, comprising: providing a non-planar stamp having a stamping surface; disposing a substrate proximate to the stamping surface; and modulating the dimensions of the stamp to place the stamping surface in contact with the substrate.

An embodiment of the claimed invention is depicted in Figures 1A-1F, which illustrate a method for stamping the exterior of a cylindrical substrate. As described in the specification, a non-planar (tubular) stamp 10, having a stamping surface on its interior, is used to stamp the exterior of the cylinder 16 (page 11, lines 5-20). The stamping *surface* shown in Figure 1A is formed by raised portions punctuated by recessed portions on the interior of the stamp. The tubular stamp is then deformed to increase the diameter of the lumen 14 (Figure 1B) prior to disposing the substrate 16 (hatched lines) within the stamp (Figure 1C). Deformation of the stamp is then reversed so that the diameter of the lumen decreases and the stamping surface contacts the substrate (Figure 1D).

Another embodiment of the invention now claimed is depicted in Figures 5A-5D, which illustrate a stamping method for the interior of a columnar substrate (see page 17, line 23 to page 18, line 2). Figures 5A and 5B show a non-planar, cylindrical stamp 10 having a stamping surface on its exterior (with recessed portions (24) and raised portions (28)) and a columnar substrate 16. As described in the specification, “the substrate may be passed around the outside of the stamp [Figure 5B] and patterned on its interior. In this embodiment, the stamp 10 is passed inside a lumen of the substrate 16 and its interior lumen pressurized, expanding the stamp to place it in contact with the inside surface of the substrate” (Figure 5D) (page 17, lines 23-26).

Yet another embodiment of the invention now claimed is depicted in Figure 2, which illustrates a stamping method for a curved but open substrate (see page 13, lines 3-9). Figure 2 shows a non-planar stamp 10 with a semi-spherical portion that is shaped to match the curvature of the substrate 16. In this embodiment, the stamping surface is placed proximate to the substrate and the dimensions of the stamp are modulated (e.g., by hydrostatic pressure) to bring the stamp and substrate into contact.

The methods presently claimed refer to a *non-planar* stamp that can be used with substrates of any geometry, particularly three-dimensional geometries. As stated in the specification, “The stamp may be adapted and constructed to conform to a substrate having a shape selected from at least partially closed, open, multi-planar, and non-planar” (page 7, lines 25-27). The dimensions of such a stamp may then be modulated by “applying a mechanical stress or an electrical stimulus, removing a mechanical stress etc.” (see page 4, lines 4-7).

In contrast, Maracas et al. discloses only *planar* stamps, which are flexed, to place them in contact with the substrate. As depicted in Figure 1 of the Maracas et al. patent, a flexible planar stamp 106, having an outer surface 108 and a stamping surface 110, is placed in contact with an “article” 102 by aligning the stamp with the article and deforming the stamp (column 3, lines 25-30 and column 5, lines 54-59). The planar stamp is deformed using a pressure controlled chamber, which shrinks to place the stamp in contact with the article, commencing at the center of the flexible stamp and proceeding outwardly away from the center (column 5, line 64 to column 5, line 18). Although flexing the stamp puts it in contact with the substrate, the stamp is planar. Maracas et al. does not teach a method that includes a step of providing a non-planar stamp.

Anticipation under 35 U.S.C. § 102 requires that the invention disclosed by the prior art reference must be identical to the claimed invention in each and every aspect. As stated in

*Hybritech Inc. v. Monoclonal Antibodies, Inc.*, 802 F.2d 1367, 231 U.S.P.Q. 81 (Fed. Cir. 1986), “[I]t is axiomatic that for prior art to anticipate under 102 it has to meet every element of the claimed invention.” Nowhere do Maracas et al. disclose a non-planar stamp that can be modulated to place the stamping surface in contact with the substrate as presently claimed. Therefore, the Maracas et al. patent does not anticipate the claimed invention and withdrawal of this rejection under 35 U.S.C. § 102(b) is requested.

#### Rejections Under 35 U.S.C. § 103

Claims 5, 8, 11-29, 32-36, and 38 were rejected under 35 U.S.C. § 103(a) as being obvious over Maracas et al. in view of Biebuyck et al. (U.S. Patent No. 5,925,259), Hidber et al. (U.S. Patent No. 6,060,121), Everhart (U.S. Patent No. 6,020,047), and Jackman et al. (1997). Applicant disagrees.

Claim 5 recites the method of claim 4, wherein the mechanical stress comprises a positive hoop stress, a negative hoop stress, or a hydrostatic stress. Claim 8 recites the method of claim 1, further comprising exposing the substrate to electromagnetic radiation by transmitting said radiation through the stamp, wherein a portion of the stamp is opaque to said radiation. Claim 11 recites the method of claim 1, wherein the stamping surface comprises a pattern comprising at least one channel defined by raised portions on the surface of the stamp. Claims 12-29 depend from claim 11. Claim 32 recites the method of claim 1, further comprising disposing a material on the substrate before the step of placing. Claim 33 recites the method of claim 1, wherein the stamp comprises a lumen having a portal providing communication between the lumen and an exterior of the stamp. Claims 34-36 depend from claim 33. Claim 38 recites the method of claim 37, wherein the stamp is adapted and constructed to contact a substrate having a surface selected from open, partially closed, and closed.

In contrast to the general teachings in the cited art, the claimed invention features novel methods for patterning a surface. As recited in independent claim 1, the present invention features a method for patterning a surface, comprising: providing a *non-planar* stamp having a stamping surface; disposing a substrate proximate to the stamping surface; modulating the dimensions of the non-planar stamp to place the stamping surface in contact with the substrate. The Maracas et al. patent lacks any teaching or suggestion of a non-planar stamp, which dimensions can be modulated to place it in contact with a substrate surface. Nor do Biebuyck et al., Hidber et al., Everhart, or Jackman et al. teach or suggest these elements of the claims.

The Maracas et al. patent discloses only planar stamps, which are flexed to place them in contact with a substrate. As depicted in Figure 1 of the Maracas et al. patent, a flexible planar stamp 106, having an outer surface 108 and a stamping surface 110, is placed in contact with an “article” (substrate) 102 (column 3, lines 25-30) by aligning the stamp with the article and deforming the stamp (column 5, lines 54-59). Pressure-controlled contact commences at the center of the flexible stamp and proceeds outwardly away from the center (column 5, line 64 to column 5, line 18). Although flexing the stamp puts the stamp in contact with the substrate, the stamp itself is planar.

Turning to Biebuyck et al., the closest this reference comes to suggesting the claimed invention is in stating that the stamp “should not be restricted to a basically flat form” (column 3, lines 1-2). Biebuyck et al. suggest that it may take on other shapes, such as rollers or half-spheres (column 3, lines 2-3). However, Biebuyck et al. do not teach of modulating the dimensions of a non-planar stamp to place the stamping surface in contact with a substrate. Biebuyck et al. teach of a stamp having an elastic *surface* that forms a “conformal contact” with the substrate, which “accommodates the unevenness of both surfaces”(column 2, lines 58-67). It is the elastic *surface* that tightens the seal between the stamp and the substrate. The Biebuyck stamp itself is not modulated. The elastic surface is particularly advantageous for the embodiments of the Biebuyck invention that pertain to microcontainers for lithographic processes. As stated in the patent, “this molecular, or conformal, contact, provides a tight seal between the microcontainer and the substrate so that the contents of the microcontainer attach the substrate only through the openings of the microcontainers” (column 4, lines 39-43). In short, Biebuyck et al. lack any teachings of modulating the dimensions of non-planar stamps to place the stamping surface in contact with a substrate.

Similar to Biebuyck, the stamp taught by Hidber et al. merely has a surface that is molded into a stamping pattern. Hidber et al. teaches a flat stamp having a patterned surface. Specifically, the Hidber et al. reference teaches of “an applicator having a contoured surface including at least one protrusion having an outward-facing application surface defining an application pattern.” (column 3, lines 23-28; see also column 5, lines 28-44). In other words, the “contoured surface” is the protrusions that form the stamping pattern. The stamp itself is not contoured.

Looking closer at Hidber et al., this reference specifically teaches of a “flat applicator” (column 6, line 22). Furthermore, Hidber et al. disclose that it is the shapes of the *protrusions*

that form the stamping pattern on the surface of the stamp, not the applicator itself, can be “any shape” (column 6, lines 26-28). Hidber et al. state that:

“Moreover, the shapes of the protrusions described and illustrated need not be of essentially rectangular cross section, but can be of any shape. In particular, protrusions having more pointed features, such as those molded in anisotropically-etched molds . . . may be used to form particularly fine features on a substrate surface” (see column 6, lines 26-34).

Nowhere does Hidber et al. teach or suggest that the applicator is non-planar. Moreover, there is no teaching or suggestion in Hidber et al. of modulating the dimensions of a non-planar stamp to place the stamping surface in contact with a substrate.

Looking to Everhart, this reference teaches an elastomeric stamp that is used to transfer by contact alkenethiol “ink” to a surface coated with a metal alloy (column 3, line 67 to column 4, line 1). The stamp is molded in a photolithographically produced master, and after inking and drying, is applied “typically by hand” to a metal alloy surface (column 4, lines 21-39). Everhart states that “very light hand pressure is used to aid in complete contact between the stamp and the surface” (column 4, lines 39-40). Therefore, Everhart merely teaches an elastic stamp that can be pressed by hand to a substrate. Nowhere in Everhart is there any mention of non-planar stamps. Furthermore, there is no mention in Everhart of modulating the dimensions of a non-planar stamp to place it in contact with a substrate. The closest Everhart comes to suggesting that the dimensions of the stamp can be modulated is in stating that the stamp is “sufficiently elastomeric to allow good conformal contact of the stamp and the surface, even for surfaces with significant relief” (column 4, lines 52-54). However, an elastomeric stamping surface that conforms to a relief pattern of a substrate does not in any way teach or suggest a non-planar stamp that can be modulated.

Finally, Jackman et al. teaches of a microcontact printing technique to fabricate a concentric cylindrical microtransformer. Jackman et al. disclose a process of “microcontact printing using a stamp with parallel lines (25  $\mu\text{m}$  wide) with a period of 50  $\mu\text{m}$ , oriented at an appropriate angle to the capillary” to generate “a continuous coil” (page 2501, column 1, second paragraph). The Jackman et al. reference describes a process by which parallel lines in a stamp are angled and rotated around a rod to generate

a coil. There is no teaching or suggestion in Jackman et al. of modulating the stamp being non-planar. Nor is there any teaching or suggesting in Jackman et al. of the dimensions of a non-planar stamp to place the stamping surface in contact with the substrate. It is mentioned that the stamp is used to print on curved substrates (page 2501, column 1, second paragraph). However, this is merely accomplished by rotating the curved substrate against the parallel lines of the stamp; not by modulating non-planar stamps.

Like Biebuyck et al., Hidber et al., Everhart, and Jackman et al. lack any teaching or suggestion of the elements of the claims lacking in Maracas et al. The cited references do not teach or suggest, either alone or in combination, modulating the dimensions of a non-planar stamp to place the stamping surface in contact with a substrate as recited in the claims. Without such teachings, the cited references cannot make the invention obvious under 35 U.S.C. 103(a). Withdrawal of this rejection is requested.

#### New claims 116-125


The rejections levied against claims 1-38 should not be applied to new claims 116-125. As noted above, new independent claim 116 parallels original claim 1 and further specifies that the stamp *comprises a lumen having a portal providing communication between the lumen and an exterior of the stamp*. The stamp in dependent claim 117 is further limited to having a lumen that includes *two portals*; claim 118 specifies that the walls defining the lumen are characterized by *flat, curved, or a combination of both*; claim 119 specifies that the stamp comprises a *tube or balloon*; claims 120-122 relate to methods for stamping the *outer* surface of a substrate by placing the substrate within the lumen; and claims 123-125 relate to methods for stamping the *inner* surface of a hollow substrate by placing the stamp within the substrate. None of the cited references teach a stamp that includes a lumen, even less a lumen having the claimed characteristics. Accordingly, the cited references cannot anticipate new claims 116-125 nor can they render those claims obvious.

#### Conclusion

Based on the arguments presented above, it is submitted that the pending claims are allowable over the art of record. Applicant would like to thank the Examiner for his thoughtful comments and careful consideration of the case. It is Applicant's understanding that no extra

claim fees are due for new claims 116-125 (1 independent claim and 10 total claims) since Applicant is also canceling claims 71-85 (1 independent claim and 15 total claims). However, if Applicant is mistaken and/or if any other fee is due please charge any fees as may be required, or credit any overpayments, to our Deposit Account No. 03-1721.

Respectfully submitted,

  
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